

Increasing the cargo capacity of combination trucks by using longer or multiple trailers can save fuel and reduce greenhouse gas emissions by up to 34 metric tons per year.

What is the challenge?

The cargo capacity of a freight truck is limited either by volume or weight. A typical combination truck (three-axle trailer with a two-axle, 53' trailer) has a cargo capacity of about 3,800 cubic feet and 45,000 pounds. The volume capacity is determined by size of the trailer, and weight capacity is generally determined by the amount of weight carried over each axle.

What is the solution?

Increasing the number of trailers that a truck hauls increases both its cubic capacity and the number of axles, making it possible to haul more cargo and improve a truck's ton-mile fuel efficiency (the amount of fuel needed to carry one ton of cargo for one mile.) Longer combination vehicles (LCVs) are combination trucks with multiple trailers and/or longer trailers than those used with a standard five-axle combination truck. Common configurations are:

- Rocky Mountain Double: One trailer up to 53 feet long and one trailer up to 28.5 feet long, with a combined weight of up to 120,000 pounds
- Turnpike Double: Two trailers, each up to 53 feet long with a combined weight of up to 148,000 pounds
- Triple: Three trailers, each up to 28.5 feet long with a combined weight of up to 132,000 pounds
- Eight Axle Twin Trailer: Two trailers, each up to 33 feet long with a total of eight axles and a combined weight of up to 124,000 pounds

The extra capacity that LCVs provide enables truck fleets to haul the same amount of cargo with fewer trips. LCVs have slightly lower fuel economy, as measured in miles per gallon, than typical combination trucks. However, because LCVs carry more cargo per trip, they require less fuel to haul a ton of freight one mile. This measure of fuel economy is called a ton-mile. LCVs generally have much better ton-mile fuel economy than other combination trucks. Since only part of a truck's fuel consumption is used to overcome mass, the percent increase in LCV ton-miles exceeds the percent increase in LCV fuel consumption. Increased productivity cuts fuel consumption and reduces greenhouse gas and air

pollutant emissions. The environmental benefits could be slightly mitigated if LCV use rises at the expense of freight train use, since freight trains are generally more fuel-efficient and have lower emissions per ton-mile than freight trucks.

Federal and state laws specify truck size and weight limits. A 1991 federal law prevents LCV expansion into states that did not permit these vehicles before the law's passage. Longer combination vehicles currently operate in 16 states west of the Mississippi River and on turnpikes in 5 states east of the Mississippi River. Twenty-nine states do not allow LCVs. Of the states in which LCVs operate, 11 allow operation of triples, 8 allow triples with permits, and 8 allow Rocky Mountain Doubles. Three states allow operation of these LCVs without restrictions.

Additional factors may influence the more widespread use of LCVs. LCVs have inherent stability and control limitations because of their length and number of trailers. Therefore, it is important that only experienced drivers under safe conditions operate LCVs. Widespread use of LCVs could have an adverse affect on bridges and other transportation infrastructure.

The results are in . . .

LCVs are more fuel-efficient, on a ton-mile basis, than typical combination trucks. For example, a Rocky Mountain Double consumes 13 percent less fuel per ton-mile of freight, compared to a typical combination truck. This saves over \$3,000 in fuel costs per year. Turnpike Doubles and Triples reduce fuel use per ton-mile by 21 percent, saving over \$5,000 in annual fuel costs.

Next steps

Trucking firms should consider use of LCVs on routes where their use is allowed and appropriate. For more information on what types of vehicle configurations are allowed in each state, contact your state or federal department of transportation, or your state or national trucking association.